## Claims

What is claimed is:

1. A high frequency oscillator, comprising:

a first center-tapped transmission line;

a second center-tapped transmission line, operated out of phase with the first transmission line;

a first oscillating circuit connected to one end of the first transmission line and one end of the second transmission line; and

a second oscillating circuit connected to the opposite end of the first transmission line and the opposite end of the second transmission line.

2. The oscillator of claim 1, further comprising:

a first plurality of capacitors for tuning the first transmission line; and

a second plurality of capacitors for tuning the second transmission line.

3. The oscillator of claim 2, wherein the first and second plurality of capacitors are variable capacitors.

4. The oscillator of claim 1 wherein the first oscillating circuit comprises a negative resistance amplifier.

5. The oscillator of claim 4 wherein the second oscillating circuit comprises a negative resistance amplifier.

6. The oscillator of claim 1 wherein the first oscillating circuit comprises:

a first coupling network, whose input is coupled to the second transmission line;

a second coupling network, whose input is coupled to the first transmission line;

a first pulse-forming network, whose input is coupled to the first coupling network and whose output is coupled to the first transmission line;

a second pulse-forming network, whose input is coupled to the second coupling network and whose output is coupled to the second transmission line.

7. The oscillator of claim 6 wherein the second oscillating circuit comprises:

a first coupling network, whose input is coupled to the second transmission line;

a second coupling network, whose input is coupled to the first transmission line;

a first pulse-forming network, whose input is coupled to the first coupling network and whose output is coupled to the first transmission line;

a second pulse-forming network, whose input is coupled to the second coupling network and whose output is coupled to the second transmission line.

8. The oscillator of claim 6, wherein the first and second coupling networks are capacitive networks.

9. The oscillator of claim 6, wherein the first and second coupling networks are resistive networks.

10. A method of generating high frequency oscillations, comprising the steps of:

operating a first center-tapped transmission line out of phase with a second transmission line;

providing a first oscillation signal connected to one end of the first transmission line and one end of the second transmission line; and

providing a second oscillation signal connected to the opposite end of the first transmission line and the opposite end of the second transmission line.

11. The method of claim 10, further comprising the steps of:

tuning the first transmission line with a first plurality of capacitors; and

tuning the second transmission line with a second plurality of capacitors.

12. The method of claim 11, wherein the steps of tuning the first and second transmission lines further comprise tuning with variable capacitors.

13. The method of claim 10 wherein the step of providing the first oscillation signal further comprises obtaining the first oscillation signal from a negative resistance amplifier.

14. The method of claim 13 wherein step of providing the second oscillation signal further comprises obtaining the second oscillation signal from a negative resistance amplifier.

15. The method of claim 10 wherein the step of providing the first oscillation signal further comprises the steps of:

coupling the first transmission line to a first pulse forming network;

coupling the second transmission line to a second pulse forming network;

coupling the output pulses from the first pulse forming network to the second transmission line;

coupling the output pulses from the second pulse forming network to the first transmission line.

16. The method of claim 15 wherein the step of providing the second oscillation signal further comprises the steps of:

coupling the first transmission line to a first pulse forming network;

coupling the second transmission line to a second pulse forming network;

coupling the output pulses from the first pulse forming network to the second transmission line;

coupling the output pulses from the second pulse forming network to the first transmission line.

17. An oscillator system for generating timing signals, comprising:

a first oscillator containing gain and non-linear elements;

a second oscillator containing gain and non-linear elements;

a first coupler for receiving a first signal from the first oscillator after the output of the gain element of the first oscillator but prior to the input of the non-linear element of the first oscillator, and providing the first signal after the output of the gain element of the second oscillator but prior to the input of the non-linear element of the second oscillator; and

a second coupler for receiving a second signal from the second oscillator after the output of the gain element of the second oscillator but prior to the input of the non-linear element of the second oscillator, and providing the second signal after the output of the gain element of the first oscillator but prior to the input of the non-linear element of the first oscillator.

18. The oscillator system of claim 17 wherein the first oscillator further comprises:

a first center-tapped transmission line;

a second center-tapped transmission line, operated out of phase with the first transmission line;

a first oscillating circuit connected to one end of the first transmission line and one end of the second transmission line; and

a second oscillating circuit connected to the opposite end of the first transmission line and the opposite end of the second transmission line.

19. The oscillator system of claim 18 wherein the second oscillator further comprises:

a first center-tapped transmission line;

a second center-tapped transmission line, operated out of phase with the first transmission line;

a first oscillating circuit connected to one end of the first transmission line and one end of the second transmission line; and

a second oscillating circuit connected to the opposite end of the first transmission line and the opposite end of the second transmission line.

20. The oscillator system of claim 18 wherein the first oscillating circuit further comprises a negative resistance amplifier.

21. The oscillator system of claim 20 wherein the second oscillating circuit further comprises a negative resistance amplifier.

22. The oscillator system of claim 18 wherein the first oscillating circuit comprises:

a first coupling network, whose input is coupled to the second transmission line;

a second coupling network, whose input is coupled to the first transmission line;

a first pulse-forming network, whose input is coupled to the first coupling network and whose output is coupled to the first transmission line;

a second pulse-forming network, whose input is coupled to the second coupling network and whose output is coupled to the second transmission line.

23. The oscillator system of claim 22 wherein the second oscillating circuit comprises:

a first coupling network, whose input is coupled to the second transmission line;

a second coupling network, whose input is coupled to the first transmission line;

a first pulse-forming network, whose input is coupled to the first coupling network and whose output is coupled to the first transmission line;

a second pulse-forming network, whose input is coupled to the second coupling network and whose output is coupled to the second transmission line.

24. The oscillator system of claim 17 wherein the first coupler further comprises a capacitive summing network.

25. The oscillator system of claim 17 wherein the first coupler further comprises a resistive summing network.

26. A method of generating high frequency oscillations, comprising the steps of:

producing first oscillations in a first oscillator containing first gain and non-linear elements;

producing second oscillations in a second oscillator containing second gain and non-linear elements;

producing a phase shift in the first oscillator by coupling the second oscillations received after the second gain element prior to the second non-linear element to the first oscillator after the first gain element but prior to the first non-linear element;

producing a phase shift in the second oscillator by coupling the first oscillations received after the first gain element but prior to the first non-linear element to the second oscillator after the second gain element but prior to the second non-linear element.

27. The method of claim 26 wherein the step of producing first oscillations further comprises:

operating a first center-tapped transmission line out of phase with a second transmission line;

providing a first oscillation signal connected to one end of the first transmission line and one end of the second transmission line; and

providing a second oscillation signal connected to the opposite end of the first transmission line and the opposite end of the second transmission line.

28. The method of claim 27, further comprising the steps of:

tuning the first transmission line with a first plurality of capacitors; and

tuning the second transmission line with a second plurality of capacitors.

29. The method of claim 28, wherein the steps of tuning the first and second transmission lines further comprise tuning with variable capacitors.

30. The method of claim 27 wherein the step of providing the first oscillation signal further comprises obtaining the first oscillation signal from a negative resistance amplifier.

31. The method of claim 30 wherein step of providing the second oscillation signal further comprises obtaining the second oscillation signal from a negative resistance amplifier.

32. The method of claim 27 wherein the step of providing the first oscillation signal further comprises the steps of:

coupling the first transmission line to a first pulse forming network;

coupling the second transmission line to a second pulse forming network;

coupling the output pulses from the first pulse forming network to the second transmission line;

coupling the output pulses from the second pulse forming network to the first transmission line.

33. The method of claim 32 wherein the step of providing the second oscillation signal further comprises the steps of:

coupling the first transmission line to a first pulse forming network;

coupling the second transmission line to a second pulse forming network;

coupling the output pulses from the first pulse forming network to the second transmission line;

coupling the output pulses from the second pulse forming network to the first transmission line.

34. A high frequency oscillator comprising:

a differential resonator;

a first coupling network, whose input is coupled to the first side of the resonator;

a second coupling network, whose input is coupled to the second side of the resonator;

a first pulse-forming network, whose input is coupled to the first coupling network and whose output is coupled to the second side of the resonator;

a second pulse-forming network, whose input is coupled to the second coupling network and whose output is coupled to the first side of the resonator.

35. The oscillator of claim 34 wherein the differential resonator comprises:

a first center-tapped transmission line;

a second center-tapped transmission line, operated out of phase with the first transmission line.